**UNITED STATES MARINE CORPS**
III MARINE EXPEDITIONARY FORCE
UNIT 35601
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FORCE ORDER P4795.1

From: Commanding General
To: Distribution List

Subj: STANDING OPERATING PROCEDURES (SOP) FOR THE III MARINE EXPEDITIONARY FORCE (III MEF) CORROSION PREVENTION AND CONTROL PROGRAM (CPAC) (SHORT TITLE: CPAC SOP)

Ref: (a) MCO P4790.2
(b) MCO 4790.18
(c) MCO P5090.2
(d) MCO P5100.8
(e) TM 4700-15/1
(f) TM 4795-12-1
(g) TM 4795-34-2

Encl: (1) LOCATOR SHEET

1. Purpose. To establish policy, procedures, and responsibilities for corrosion prevention and control for all III MEF equipment.

2. Action. III MEF Major Subordinate Commands/Elements (MSC/E(s)) will ensure compliance with this order and will issue amplifying instructions and procedures as necessary. MSC/E(s) are not required to produce companion SOP(s). MSC/E specific policies, procedures, and instructions may be incorporated within this SOP as a separate Appendix.

3. Recommendations. Recommendations concerning this order are invited from all III MEF organizations. Recommendations should be submitted via the appropriate chain of command to the Commanding General, III MEF (AC/S, G-4).

4. Applicability. This order is applicable to all organizations organic to III MEF. It serves as the baseline document for all CPAC Programs and is to be used in conjunction with references (a) through (g) and other applicable references as may be appropriate.

5. Certification. Reviewed and approved this date.

D. C. O'BRIEN
Chief of Staff

DISTRIBUTION: LIST I/II

LOCATOR SHEET

Subj: STANDING OPERATING PROCEDURES (SOP) FOR THE III MARINE EXPEDITIONARY FORCE (III MEF) CORROSION PREVENTION AND CONTROL PROGRAM (CPAC) (SHORT TITLE: CPAC SOP)

Location: _____
(Indicates location(s) of the copy(ies) of this order.)

CPAC SOP

RECORD OF CHANGES

Log completed change action as indicated.

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# CHAPTER 1

## CORROSION PREVENTION AND CONTROL PROGRAMS

# CHAPTER 1

## CORROSION PREVENTION AND CONTORL PROGRAMS

### 1000. INTRODUCTION

1. Background. III MEF Operating Forces operate daily and deploy in corrosive environments. Consequently, corrosion presents one of the greatest challenges to the readiness and capability of III MEF equipment. To combat this challenge, corrosion prevention and control must be an integral part of the preventive maintenance effort in order to prevent degradation of III MEF equipment to the point it is unserviceable or unsuitable for use. While corrosion cannot be stopped in total due to our operating environment and the design of our equipment, a robust CPAC Program will ameliorate the affects of corrosion thereby extending useful service life of equipment, conserving resources, improving readiness and sustaining capability.

2. With few exceptions, equipment in use by III MEF Operating Forces is not designed with corrosion prevention in mind. Future acquisitions such as the High Mobility Muti-purpose Wheeled Vehicle (HMMWV) replacement, Medium Tactical Vehicle Replacement (MTVR), and the Advanced Amphibious Assault Vehicle (AAAV) hold promise in the area of corrosion resistance. Until these and other new corrosion resistant equipment acquisitions are fielded, corrosion prevention and control will continue to challenge us and will become even more difficult as equipment continues to age and our depot maintenance capability continues to diminish. These factors alone demand aggressive action on our part to implement and execute effective CPAC Programs.

3. Formalized CPAC programs have historically not been developed and applied. This SOP reverses that trend. All III MEF organizations must develop and execute a comprehensive CPAC Program down to the individual equipment operator. We have no choice in this matter.

### 1001. DEVELOPING A CPAC PROGRAM

1. CPAC Program development should occur no differently than any other maintenance or maintenance management related program. Reference (a) should serve as a model for CPAC Program

development. Figure 1-1 on page 1-14 of reference (a) is a superb template around which to design a CPAC Program. A successful CPAC Program will be built around the elements of Command, Resources, Production, and Information.

2. As with implementation of any new program, an organization cannot map where it is going unless it knows where it has been and where it currently is. Simply put, an organization needs to Baseline its current corrosion problem in order to determine its priority of work in achieving the highest state of CPAC readiness possible and to also determine the best manner in which to execute its CPAC program. The base lining effort is best accomplished by a thorough one hundred percent inspection of the organization's equipment. Equipment should then be categorized per paragraph 1001.3. The results of this effort will be the baseline from which the success of the organization's CPAC Program will be measured. Accordingly, all III MEF organizations will baseline the extent of equipment corrosion through a thorough and rigorous inspection upon receipt of this order. This process is to be repeated annually on or as near as possible to the anniversary date of the initial base lining effort.

3. III MEF has adopted a five-category system to classify the extent of corrosion existing for each item of equipment. The corrosion categories and their definitions are depicted in figure 1-1. The forthcoming MCO 4790.18 will also list a corrosion categorization system that contains four Alpha-designated categories. The III MEF categorization system provides a greater level of detail and will be the standard used by III MEF organizations. Appendix C provides a MCO 4790.18 - ForO 4795.1 corrosion categorization conversion chart.

| CATEGORY | DEFINITION | GOAL |
|---|---|---|
| Corrosion Condition 1 (CC-1) | Requires little or no effort. Is in the best condition with regard to corrosion. | The goal at this level is maintain the end item as CC-1 |
| Corrosion Condition 2 (CC-2) | Requires surface preparation and spot paint at the operator and/or organizational level. | The goal of this effort should be to return this end item to CC-1. |
| Corrosion Condition 3 (CC-3) | Requires effort beyond the operator level and will require assistance at the mechanic/technician level beyond the organic level. Example: Spot painting has arrested the corrosion, but the vehicle requires complete repainting and overcoat. Must be managed by the Unit Commander and inducted into the Corrosion Rehabilitation Facility (CRF) for painting. | The goal of this effort is to schedule the end item into the CRF and return the end item to CC-1 |
| Corrosion Condition 4 (CC-4) | Requires repair to sheet metal or major frame components beyond the organizational level and must be inducted into Intermediate level repairs prior to induction into the CRF. Example: Chassis frame rails on HMMWVs, or support frames on cargo trailers. | The goal of this effort is to immediately induct this end item into the Intermediate Maintenance Level and manage the repairs through the IMA and into the CRF. |
| Corrosion Condition 5 (CC-5) | Is degraded to a degree that requires replacement of the end item based on the deterioration caused by corrosion. | The goal of this effort is to replace the end item |

Figure 1-1. - III MEF Corrosion Categorization

4. Once a CPAC Program has been developed, a comprehensive training plan must then be developed and implemented in order to ensure success. Training can be accomplished in many ways such as classroom instruction, hands-on practical application, and instruction by outside experts. All of the above should be employed in order to achieve a balanced and effective training program. Classroom training alone will not achieve the desired level of expertise among an organization's Marines. The organization's Maintenance Management Officer (MMO) must also ensure CPAC training is included in the training plan along with other maintenance and maintenance management related training topics. The training must be documented. Particular attention to training of Unit Deployment Program (UDP) organizations is especially important, as many of these organizations are home-based in geographical areas of the Continental United States (CONUS) where the environment does not pose the same corrosion challenges as does the environment in Okinawa.

5. The key to CPAC Program continuity is comprehensive SOP(s), Desktop Procedures, and Turnover Files. Whether an organization uses this SOP and adds its own unique policies or produces its own SOP, a SOP is the foundation of the CPAC Program. CPAC specific Desktop Procedures and Turnover files may be developed or CPAC Program requirements may be included in existing maintenance management related documents of this type. Whatever method is selected for documenting CPAC Program requirements and procedures, Desktop Procedures and Turnover Files must cover CPAC Procedures in sufficient detail to ensure continuity of program execution when key Marines leave the organization.

## 1002. DESIGNATION AND ASSIGNMENT OF CPAC PROGRAM COORDINATOR

1. Focus of effort is a critical component to success in the fight against corrosion. While corrosion control is not a new concept to the Marine Corps, we live in an age where new CPAC technologies, products and procedures are developed and emerge on a constant basis, (given the operational tempo and every day maintenance challenges of III MEF organizations, it is unreasonable to expect that these new developments in CPAC can keep pace without a focused effort in the area of CPAC technology, product and procedure development). Additionally, as new technologies, products and procedures are adopted, a mechanism must be put in place to ensure that these new tools in the corrosion fight are employed in a consistent manner across the scope of an organization's CPAC effort.

2. In order to ensure the necessary focus of effort is applied within CPAC Programs, III MEF Major Subordinate Command/Elements will, at a minimum, assign in writing as a collateral duty, a CPAC Program Coordinator. The CPAC Program Coordinator will be responsible for coordinating the organization's CPAC effort and will further act in a quality assurance role to ensure the CPAC Program is uniformly executed across the scope of the organization's CPAC and maintenance effort.

1003. INFORMATION RESOURCES

1. There are many sources of information regarding CPAC and associated tasks. Many of these information resources take the form of Marine Corps/Army/DoD Orders, Technical Manuals, and Technical Bulletins. Other information resources may include commercial technical manuals and bulletins; civilian-authored reference books; and scientific and informational Web Sites. Marines involved in the corrosion prevention fight should not limit themselves to one source of information and should continually seek the most up-to-date source of CPAC information. The list below is not intended to be all-inclusive, but provides a baseline starting point for building a CPAC library that will support an organization's CPAC Program.

a. MCO P4790.2. MIMMS Field Procedures Manual. This manual establishes policy and procedures for management of Marine Corps ground equipment maintenance. It provides the basic outline for all maintenance management and maintenance related programs.

b. MCO 4790.18. Corrosion Prevention and Control (CPAC) Program: To publish policy establishing the CPAC for Marine Corps tactical ground and ground support equipment, and to assign duties and responsibilities to accomplish the objectives of this program.

c. TM 4700-15/1. This manual will instruct users how to properly fill out forms and records associated with ground equipment. This includes such forms as Product Quality Deficiency Reports (PQDR's) and Equipment Repair Orders (ERO's).

d. TM 4795-12. Describes depot corrosion control materials and procedures. This manual can be used to ensure end items received from Remote Storage Activities (RSA) and/or Depot level maintenance facilities have had proper CPAC procedures applied.

If equipment discrepancies are found based on the requirements of this Technical Manual, a Supply Discrepancy Report (SDR) and/or PQDR should be submitted by the receiving organization through the appropriate chain of command to Commander, Marine Corps Material Command with a detailed narrative of noted discrepancies.

e. TM 4750-15. Describes camouflage paint patterns for ground equipment. Discusses methods for cleaning and preparing surfaces prior to painting, application procedures for Waterborne Camouflage Coating (WBCC), and procedures for marking and camouflaging equipment.

f. TM 4795-12-1. Describes techniques and procedures and products that shall be used at the 1st and 2nd echelon of maintenance to fight the corrosion battle for Marine Corps Equipment. This manual is for use in controlling corrosion and wear on USMC equipment.
***(Note: This technical manual replaces TM 3080-12, which is now obsolete)***

g. TM 4795-34-2. Describes techniques to be used at the 3rd and 4th echelon level to fight the corrosion control battle. It includes Rust- proofing Procedures for Tactical Vehicles and Trailers. This technical manual defines types of corrosion as well as key corrosion prevention techniques and materials, material application instructions, and important application safety hazards.
***(Note: This technical manual replaces TM 3080-34, which is now obsolete)***

h. The USMC CPAC web site is also a valuable source of CPAC information. This web site requires a password for access. Instructions for obtaining a password are contained on the web site. Users can access the CPAC web site through the Marine Corps Systems Command (MCSC) web site at www.marcorsyscom.usmc.mil.

i. The Tri-service coatings Website provides information on approved Chemical Agent Resistant Training coatings at www.arl.army.mil/wmra/coatings.

1004. REPORTS AND RECORDS

1. Accurate historical information is essential to any Baselining and analysis effort. References (a) and (d) provide guidelines and procedures for maintenance and maintenance management related equipment records. All Marines are responsible for the accuracy of CPAC records and reports. It is vitally important to the success of the CPAC Program that CPAC related information is accurately documented per reference (d).

2. All III MEF organizations will submit the results of their annual CPAC Program equipment inspection, hereafter referred to as "Annual CPAC Equipment Report, to the Commanding General, III MEF, attention AC/S, G-4/Material Readiness Branch, (AC/S, G-4/MATREAD Br, III MEF) via their respective Major Subordinate Commands (MSC(s)). The annual CPAC equipment report will be due no later than the last day of the third quarter of the fiscal year. The annual CPAC inspection may be accomplished anytime during the current fiscal year prior to that date. The Annual CPAC Equipment Report format is found in Appendix A of this order.

3. Marine Corps Material Command (MATCOM) requires the operating forces to provide two reports regarding fiscal expenditures and requirements. Each quarter, all operating forces are required to submit quarterly CPAC expenditure reports. Operating forces are also required to submit projected CPAC expenditures for the next two Fiscal Years (FY), for example, projected CPAC expenditure requirements submitted in November of 2000 (FY-01) would reflect CPAC requirements for FY(s) 2003 and 2004. The III MEF CPAC Coordinator will request CPAC expenditure data from III MEF organizations by message when the information is required.

1005. INTERNAL REVIEWS AND INSPECTIONS

1. Paragraph 4007 of reference (a) goes into detail concerning inspections and their value to the Commander and should be used as template for CPAC Program internal reviews/inspections.

Periodic focused internal reviews/inspections provide the commander a snap shot of whether the organization's programs, policies, practices, and staff functioning are meeting the Commander's expectations and goals. Internal reviews/inspections further provide the Commander a "scorecard" to measure how the organization is performing relative to the benchmarks set by that organization.

2. III MEF organizations at the battalion/squadron levels and above will incorporate CPAC Program provisions into their Internal Review/Inspection Programs using this order and the Inspection Checklist contained in Appendix B as a basic guideline.

3. Additionally, the local Field Supply and Maintenance Analysis Office (FSMAO-3) will be requested to include analysis of organizational CPAC Programs as a matter of routine during analyses of III MEF organizations.

1006. OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS

1. An Occupational Health and Safety Chapter will be added to this SOP in the future.

2. The health and safety of our Marines is of paramount importance and takes priority over all other garrison considerations. Reference (d) is the Marine Corps Occupational Health and Safety Program Manual and will be strictly followed. CPAC actions have the potential to expose Marines to hazardous materials that can adversely affect the health and safety of Marines if proper procedures are not followed. Though of paramount importance, past concern for the health of our Marines has resulted in unnecessary prohibitions regarding CPAC actions such as "rust busting" and spot painting. Appendix F is a study conducted by U. S. Naval Hospital regarding exposure to heavy metal particulate when scraping and chipping Chemical Agent Resistant Coating (CARC) paint. The results of the study indicate that Marines may chip and scrape all types of CARC paint with hand tools without using respiratory protective equipment. In other words, Marines may "bust rust" with hand scrapers and wire brushes. Spot painting with the use of CARC, Water Borne CARC (WBCC) and Water Reducible CARC (WRCC) is permitted without the use of respiratory protective equipment within the standards of applicable Material Safety Data Sheets (MSDS) and other technical documentation.

3. Personal Protective Equipment (PPE) requirements become more stringent when powered tools and spray-painting operations are performed. Spray painting of CARC paint is not permitted at the organizational level of maintenance and may only be performed at the Corrosion Rehabilitation Facility located at Camp Kinser. For additional information regarding use of powered tools for corrosion removal see Chapter 3, Paragraph 3003.2.

CPAC SOP

CHAPTER 2

# THE CORROSIVE ENVIRONMENT

# CHAPTER 2

# THE CORROSIVE ENVIRONMENT

## 2000. INTRODUCTION

1. The Ryuku and Hawaiian Island Chains are located in the Western and Central Pacific Ocean respectively. The environment of both island chains is characterized by high humidity, warm temperatures, intense sunlight and constant exposure to the salt air ocean environment. The majority of III MEF organizations are positioned on the island of Okinawa in the Ryukan Island Chain and the island of Oahu in the Hawaiian Island Chain. In addition, Hawaii-based III MEF organizations conduct a significant amount of training at the Pokalua Training Area, located on the main island of Hawaii. III MEF organizations are also positioned at Marine Corps Air Station (MCAS), Iwakuni, Japan and at the III MEF Combined Arms Training Center (CAT-C), Camp Fuji, Japan. III MEF organizations stationed at MCAS, Iwakuni, Japan face environmental conditions similar to III MEF organizations in Okinawa and Hawaii. However, the corrosive environment at MCAS, Iwakuni, Japan is not as severe as that of Okinawa or Hawaii. CAT-C, Camp Fuji, Japan has the least corrosive environment of all the locations where III MEF organizations are positioned.

2. In addition to being home-based in Okinawa, Iwakuni and Hawaii, III MEF organizations constantly deploy aboard naval ships for amphibious training and exercises to other locations in the Pacific Ocean with similar environments to those of Okinawa, Iwakuni and Hawaii.

3. As illustrated in the preceding paragraphs, III MEF organizations operate daily and deploy in environments that are conducive to corrosion and that present special challenges to the readiness and capability of III MEF equipment.

## 2001. ENVIRONMENTAL FACTORS

1. Numerous environmental factors contribute to the corrosive environment. The most commonly recognized factor in a corrosive environment is proximity and exposure to salt water and salt ocean air hereafter referred to as the "Marine Environment." However, this is but one factor that must be considered. The following is a summary of factors that collectively contribute to the corrosive environment and that must be taken into consideration in the fight against corrosion.

a. The Marine Environment. Saltwater is a naturally occurring electrolyte and promotes electrochemical corrosion, the process of changing the chemical structure of a metal or alloy due the electron flow in an electrolyte. Electrochemical corrosion is the most common form of corrosion affecting Marine Corps equipment.

b. Rain. Rain is another naturally occurring electrolyte, though not as damaging in and of itself as saltwater. However, when rain mixes with salt spray during periods of high winds it in essence becomes salt water and will promote corrosion the same as salt water.

c. Petroleum-based Products (POL). Though not commonly recognized as such, some POL(s) like hydraulic fluid and fuels can act as electrolytes and promote corrosion when in contact with metal surfaces.

d. Corrosive Fluids. Fluids such as battery acid, the most commonly recognized electrolyte, and Nuclear, Chemical and Biological (NBC) decontaminating solutions are highly corrosive and promote corrosion when in contact with metal surfaces.

e. Sunlight. Though not commonly thought of as a contributing factor to corrosion, sunlight will contribute to corrosion. Intense sunlight will cause protective finishes to deteriorate thereby making them less effective in protecting equipment from corrosion. Sunlight will also dry out salt spray leaving residual salts that slowly promote corrosion when dry and become very active when "re-wetted" as a result of rain.

d. Wind. Strong sea breezes and winds generated by storms, tropical storms and typhoons can be heavily saturated with salt spray and can force high concentrations of salt water into mating surfaces and crevices of equipment thereby promoting corrosion in hard to reach hard to inspect areas.

2. In order to be fully effective, a CPAC Program must take all environmental factors into consideration. Even if an organization has not deployed its equipment aboard shipping or directly exposed it to seawater, the equipment is still at risk from the overall corrosive environment.

## 2002. THE SCIENCE OF CORROSION

1. Corrosion. Understanding the science of corrosion is important to understanding how to combat it. Corrosion is the process of metal deteriorating or returning to its natural state. Corrosion occurs in all metals at different rates and under different circumstances. The marine environment promotes electrochemical corrosion, the process of changing the chemical structure of a metal or alloy as a result of the flow of electrons in an electrolyte.

2. Electrochemical corrosion occurs when an electrolyte is in contact with two dissimilar metals. As noted in paragraph 2001.1, seawater, salt spray, and rain are common naturally occurring electrolytes while POL(s), decontaminating solutions, and battery acid are man-made electrolytes. Electrolytes allow an electrical current to flow between the two dissimilar metals creating a "charge" which is called a "galvanic reaction" in which one of the metals corrodes.

3. There are four elements that must be present for corrosion to occur: an anode, a cathode, an electrical path, and an electrolyte.

a. An anode is a metal that is more susceptible to corrosion.

b. A cathode is a metal that is less susceptible to corrosion.

c. The electrical path is the flow of electrons between the anode and cathode.

d. An electrolyte is a solution capable of conducting current between the anode and the cathode.

4. During the corrosion process, a small current flows between the anode and the cathode. This current occurs as a result of the voltage potential differential that exists between the anode and cathode. This is the same process that allows a battery to produce voltage and power. The flow of current between the anode and cathode causes corrosion to occur on the anode. Corrosion on a single metal, or general corrosion is caused by formation of microscopic anodes and cathodes.

5. If the four elements of corrosion are viewed as a square, each element being one side of the square, the "Corrosion Square" must be broken in order to arrest or prevent corrosion. The Corrosion square can be broken in a number of ways. Avoiding use of dissimilar metals in the manufacturing process is one way to break the Corrosion Square. However, at the operating force level, we have little control over the manufacturing process and must fight the effects of corrosion on equipment that is in our inventories. Corrosion at the operating force level must be fought by maintaining effective barriers to block electrolytic current flow.

6. Paragraph 2 of reference (e) goes into great detail on the science of corrosion and should be thoroughly reviewed by all Marines, both maintainers and operators.

# CHAPTER 3

# CORROSION PREVENTION AND CONTROL MEASURES

# CHAPTER 3

# CORROSION PREVENTION AND CONTROL MEASURES

## 3000. INTRODUCTION

1. CPAC starts with prevention. Prevention starts with the individual equipment operator. All too often in the past, CPAC has been viewed as a "maintenance function." If corrosion on an item of equipment has reached the point where the item must be turned into the supporting maintenance section for corrective action, it is too late and our CPAC efforts have failed. The equipment operator is the first line of defense in the battle against corrosion. Reference (e) provides detailed procedures and instructions to be employed in achieving CPAC. This chapter only summarizes the detailed information contained in reference (e), which must be used as the CPAC standard in all III MEF organizations.

## 3001. THE CLEANING, INSPECTION AND PRESERVATION PROCESS

1. CPAC is best achieved by equipment operator application of the three-step "CIP" process as depicted below:

Cleaning_____C
Inspection_____I
Preservation_____P

a. Cleaning: Removing rust, oxidation, dirt and salt and other contaminants from the surface of metal is the first step in the CPAC process. Cleaning procedures depend on the type of material to be cleaned (plain steel, Stainless steel, aluminum alloy, composite, rubber, etc.), severity of corrosion, and available cleaning equipment and materials.

b. Inspection: Thorough inspection of equipment is the second step in the CPAC process. Equipment operators must assess the material condition of their equipment: look for corrosion, coating damage, trapped water, and contaminated surfaces. The frequency of corrosion inspection should increase with the operational tempo, severity of the environmental conditions, and importance of the component/vehicle.

c. Preservation: Preservation of a clean, corrosion-free surface is the third and final step of the CPAC process. Preservation helps to protect equipment and parts by providing coatings, anti-seizes, sealant, and water displacing and corrosion preventive compounds (CPCs). Preservatives should be used after equipment cleaning, before and after deployment, and when an extended period of equipment storage is anticipated (unless dehumidified storage is planned). Paints such as Water Reducible Camouflage Coating (WRCARC), and their epoxy primers are certainly part of a preservation plan. These coatings provide long-term protection, and should be used when possible instead of CPCs, which only provide short-term protection.

2. The importance of thoroughly cleaning equipment cannot be overstated. The cleaning process must be employed on a consistent basis both while in garrison and especially after field or amphibious operations. The freshwater rinse is one the simplest and most effective cleaning methods employed in CPAC. The fresh water rinse should occur periodically when in garrison and as soon as practical after field operations, seawater or salt spray exposure. When using a pressurized hose to clean equipment, care must be taken not to spray electrical and communications components at full pressure. Instead, use a fine spray on components of this type, or clean them by hand. Special care must also be taken when cleaning equipment to ensure mud, dirt, and debris are completely removed from chassis, crevices and other areas of equipment where these types of material can build up. Additives are available for use with freshwater to help neutralize salt more efficiently. However, not all work well, and some even accelerate corrosion on metals such as aluminum. Care must be taken when using additives during freshwater rinsing. Understandably, when embarked on amphibious or other ships or when in the field, freshwater may not be available in the amounts necessary. This increases the importance of other corrosion control measures such as coating preservation and the use of corrosion preventive compounds.

3. Thoroughly sealing equipment to keep water and moisture out is also a simple and effective corrosion control measure that can be employed for items of equipment such as ordnance vehicles, communications equipment, engine and transmission housings, and other types of closed components. When it is impractical to seal an item, or when the chance of obtaining an effective seal is low, every effort must be made to drain trapped water at the lowest point in the equipment. If the design of the equipment makes it susceptible to water collection and retention and does not provide for a means of draining

trapped water at the lowest point, a Product Quality Deficiency Report (PQDR) should be submitted in accordance with the current edition of MCO 4855.10. Mating surfaces switches, covers, and holes for fasteners are places where sealant should be applied. The choice of a sealant depends on where and how it will be used, the types of fluids it may come in contact with, the operating temperature of the sealed component, and the amount of routine maintenance normally performed inside the component. Sealing procedures will normally be accomplished at the organizational level of maintenance or higher.

4. The most corrosive environments USMC ground equipment is exposed to are beach operations, Landing Craft, Air Cushioned (LCAC) operations, and transport in the well decks of U. S. Navy amphibious shipping. Operation in these types of environments is inherent in our mission. For many years there was little Marines could do to prevent or even mitigate corrosion from occurring as a result of operating in these type environments. However, with the introduction and approved use of new commercial additives and inhibitors, corrosion can be prevented or at least mitigated through careful use of additives and inhibitors.

5. Protection of the equipment from the weather is another way to prevent corrosion, prolong service-life and reduce maintenance requirements. Keeping vehicles or equipment stored under simple open-sided covered structures can reduce exposure to rain and direct sunlight and acts to preserve the integrity of corrosion coatings as well as preventing water from accumulating in equipment. Tarps, canvases or other materials can also be used to protect equipment. However, strict guidelines must be developed and applied to ensure "tarped" equipment is not allowed to sit under wet tarps. Tarps can in fact promote corrosion if allowed to cover equipment while wet.

## 3002. SPECIAL CONSIDERATIONS FOR DEPLOYED OPERATIONS

1. As mentioned above, deployed operations pose special challenges relative to CPAC. The deployed environment, lack of facilities, lack of time and the non-availability of freshwater for wash downs all contribute to the CPAC challenge. These challenges can sometimes be overcome by careful pre-deployment post-operation maintenance recovery planning.

2. Careful pre-deployment preparation of equipment for the corrosive environment is also of paramount importance in preventing or mitigating corrosion while deployed. Appendix B of reference (e) provides a detailed checklist of pre, during and post deployment actions that should be followed by deploying organizations.

3. 31st Marine Expeditionary Unit (MEU) Equipment Rotation. Due to the extremely corrosive environment encountered during deployment aboard amphibious shipping, equipment rotations take on added importance as a "preservation measure". Accordingly, 31st MEU Command Element Non-Table of Equipment, Ground Combat Element (GCE), MEU Service Support Group (MSSG), and Air Combat Element (ACE) motor transport, Heavy Engineer Equipment, Ordnance Vehicles, Howitzers, and Utilities equipment will be rotated after completing three deployment cycles. Table of Equipment items assigned to the 31st MEU Command Element will, at a minimum, be inducted to the CRF for corrosion corrective maintenance and painting every 24 months.

## 3003. CORROSION CORRECTIVE MAINTENANCE AND REHABILITATION

1. Despite best efforts, equipment will corrode and require some level of maintenance or rehabilitation.

2. Organizational Level Corrective Maintenance. The equipment operator and the organizational level maintainer accomplish organizational level corrective maintenance relative to CPAC. Equipment operators remove rust and corrosion and apply protective coatings through spot painting and application of other anti-corrosion compounds. The organizational level maintainer may also remove rust and corrosion that is more extensive and requires the use of powered grinders and the like. CPAC Tool Kits have been fielded to all III MEF organizations. These kits are Type II items and may be purchased by unit Commanders in higher quantities than were initially issued. The CPAC Tool Kit is an accumulation of tools and miscellaneous items, produced by a variety of manufacturers that are used to prepare metal surfaces for protective coatings, dependant on the type metal, and the item being protected. The items in this kit comply with Environmental Protection Agency (EPA) requirements for this type equipment for handling Hazardous Materials. The kit consists of a plastic container, electric or pneumatic grinders, vacuum cleaner, needle scaler, and hazardous waste

disposal bags. The vacuum cleaner evacuates dust, paint chips and particles from the operating surface area into the hazardous material disposal bags contained within the plastic container. Other power tools, not components of the CPAC Tool Kit, may also be used providing proper PPE is used/worn. The organizational level maintainer may also replace certain corroded components, fasteners, and sheet metal components providing these type components are within authorized echelons of maintenance found in applicable technical manuals and publications.

3. Equipment corroded to the point where it exceeds organizational level repair capabilities is normally evacuated to the intermediate level of maintenance for corrective maintenance or rehabilitation. 3d Material Readiness Battalion performs intermediate level corrosion corrective maintenance and rehabilitation for Okinawa-based III MEF organizations through its Corrosion Rehabilitation Facility. Chapter 4 of this SOP addresses intermediate level corrosion corrective maintenance and rehabilitation in detail. Hawaii and Iwakuni-based III MEF organizations operate their own local intermediate level corrosion corrective maintenance and rehabilitation programs.

# CHAPTER 4

# CORROSION REHABILITATION PROGRAM

# CHAPTER 4

# CORROSION REHABILITATION PROGRAM

## 4000. INTRODUCTION

1. When preventive measures fail and corrosion damage occurs to equipment, corrective maintenance action must be taken. Corrective maintenance actions occur at both the organizational and intermediate levels of maintenance. Intermediate level corrective maintenance for corrosion damaged equipment is carried out by the III MEF Corrosion Rehabilitation Facility (CRF) for III MEF Okinawa-based organizations. The CRF is located at Camp Kinser in Okinawa, Japan and is a contractor-operated facility administered by the United States Marine Corps. The CRF is managed and supervised by Marines assigned to General Support Maintenance Company, 3d Materiel Readiness Battalion, 3d Force Service Support Group. Intermediate level corrosion maintenance/rehabilitation support for Hawaii and Iwakuni, Japan based III MEF organizations is accomplished through local procedures.

2. The CRF's primary goal is to provide a cost and time effective alternative in transporting equipment to and from the Marine Corps Logistic Bases, Albany, Georgia and/or Barstow, California. The CRF accomplishes its mission by:

a. Minimizing maintenance cycle time for equipment inducted for rehabilitation.

b. Providing quality Intermediate Maintenance Activity suuport.

c. Providing technical advice to Okinawa-based Major Subordinate Commands (MSCs) on matters related to corrosion protection and prevention.

3. CRF repairs equipment and vehicles from all commodities; communications, engineers, motor transport, and ordnance. Aside from supporting III MEF, CRF also provides support to the Army, Air Force, and Navy units on Okinawa. The facility repairs body components that would normally be replaced, restoring them to the original specifications. This process not only saves the owning unit precious maintenance and operational funds, but also enables owning unit maintenance personnel to concentrate their efforts on other maintenance tasks. CRF can usually make the necessary repairs and return the equipment to "like new" condition even when corrosion damage is extensive.

4. A local civilian contractor is responsible for supervising and executing all contract work conducted at the CRF. Marines assigned to CRF provide quality assurance and contract supervision. The civilian contractor provides all necessary labor, management, supervision, tools, equipment, and supplies. The 3d FSSG provides the facility, paint, undercoating, sandblasting supplies, administrative support, waste collection and disposal, and utilities. The initial Corrosion Rehabilitation Contract was established in the early 1970s using local vendors; however, during 1981 corrosion rehabilitation activities were moved to United States Government facilities located at Camp Kinser. The current facility opened in 1996.

5. All maintenance performed at the CRF will be conducted in accordance with the Statement of Work (SOW) contained within the Corrosion Contract issued by the Far-East Regional Contracting Office.

## 4001. CRF ORGANIZATION

1. The CRF falls under administrative and operational control of General Support Maintenance Company (GSMCo), 3d Materiel Readiness Battalion, 3d Force Service Support Group. However, on matters dealing with the monthly service contracts and the processing of the contractors monthly invoices, the Contracting Officer's Representative (COR) is authorized direct liaison with 3d Materiel Readiness Battalion, Materiel Operations Center Fiscal and the Regional Contracting Office.

2. CRF Maintenance Chief: The CRF Maintenance Chief is responsible for the smooth and efficient operation of all maintenance and administration functions. The CRF Maintenance Chief works directly for the Officer in Charge (OIC) of Support Platoon, GSMCo, but may make direct liaison with the Materiel Operations Center, and Regional Contracting Office on matters relating to contract payment and invoices for services performed at the CRF. During normal day-to-day operation of the CRF, the CRF Maintenance Chief will use the GSMCo chain of command. Additionally, the CRF Maintenance Chief will be assigned the collateral duty of Contracting Officer's Representative (COR). In this capacity, he/she is the government's representative for the contract and is the direct link with civilian contractor. The COR endorses all service contracts and monthly invoices and accepts equipment on behalf of the government. The CRF Maintenance Chief will hold weekly informal meetings with the contractor to

discuss work schedules and any minor problems that might occur within the CRF. As the COR, the Maintenance Chief will file a monthly surveillance report to the Commanding General, Marine Corps Base, Camp Smedley D. Butler (Attn: RCO Far-East) by the 5th day of each month concerning contract status and events for the preceding month. The CRF Maintenance Chief also acts as the Customer Service Representative for III MEF customers.

3. CRF Assistant Maintenance Chief: The Assistant CRF Maintenance Chief coordinates processing of the monthly service contracts with the contractor. The Assistant CRF Maintenance Chief will monitor the Marine Corps Integrated Maintenance Management System (MIMMS) reports and stock overhead supplies to ensure an adequate amount of supplies are on hand to accomplish the mission. Additionally, the Assistant CRF Maintenance Chief will be assigned as the Assistant COR.

4. CRF Floor Chief: The CRF Floor Chief is the senior Quality Control Inspector on the shop floor. The CRF Floor Chief coordinates inspections conducted on equipment at each stage in the repair cycle with the contractor's Project Manager.

5. CRF Quality Assurance Inspectors: Quality Assurance Inspectors perform the bulk of inspections on equipment both in the active maintenance phase and upon completion of corrosion rehabilitation work. The CRF Floor Chief supervises these Marines. The Contractor's Project Manager will notify the Floor Chief, COR, or ACOR when equipment is ready for inspection. Supervisors are responsible for assigning an inspector to inspect the equipment. The inspectors will ensure work meets the standards set forth in the SOW and applicable orders or directives related to specific items of equipment.

6. CRF HAZMAT NCO: The Hazardous Material (HAZMAT) Non-commissioned Officer (NCO) works directly for the CRF Floor Chief. He/she is responsible for the safe handling and disposal of all waste products in CRF, as well as the disposal of recyclable items, scrap metal, empty paint cans and empty cardboard boxes per reference (c). The HAZMAT NCO is responsible for the respiratory management program within CRF per reference (d). He/she will ensure all personnel assigned to CRF have completed and passed the appropriate medical screening. The HAZMAT NCO will provide the necessary training to all personnel assigned to CRF on all safety and hazardous materials/waste handling, use and disposal. The HAZMAT NCO will coordinate CRF hazardous Material/Waste issues with the GSMCo HAZMAT Representative and the Camp HAZMAT Supervisor.

## 4002. CORROSION REHABILITATION NOMINATIONS

1. The amount of equipment that may pass through the CRF in a given Fiscal Year is predicated by the amount of CPAC funding provided to III MEF by Marine Forces, Pacific. The III MEF Headquarters will provide the amount of funding available for CRF operation to the Commanding General, 3d FSSG at the beginning of each Fiscal Year. Once the funding line has been established, the AC/S, G-4, III MEF will allocate corrosion rehabilitation quotas to each MSC during October of each fiscal year and provide those quotas to the CRF. The CRF will ensure MSC(s) do not exceed their allotted quotas. The CRF will also monitor MSC quotas to ensure maximum advantage is being taken of quota allocations. Okinawa-based III MEF organizations will submit equipment nominations to the CRF via respective MSC(s). Nomination lists are due to CRF by the 20th of the each month per the example in Appendix D. Nominations may also be submitted by electronic mail (e-mail). The CRF will inform the AC/S, G-4/Material Readiness Branch, III MEF if allotted quotas are exceeded or if they are not being filled on an as required basis.

2. Guidelines for corrosion rehabilitation quotas and nominations are set forth by the AC/S, G-4, III MEF. Request for changes to total MSC quota allocations must be submitted to the AC/S, G-4, III MEF citing ample justification as adjustment of MSC quotas may impact another MSC. Once each MSC has allocated its quotas to individual subordinate elements, changes to an individual unit's nomination quotas must be submitted to the CRF via the respective MSC.

3. III MEF corrosion rehabilitation eligible equipment is divided into equipment sizes based on cubic feet and not equipment characteristics. The new Ultra Light category is for the payment of the contractor only and does not affect the old or existing quotas listed in paragraph 4. Equipment size classifications are depicted in Figure 4-1. The AC/S, G-4, III MEF will publish a TAMCN equipment size classification category message at the beginning of each fiscal year.

| CLASSICATIONS | DEFINITION | EXAMPLE |
|---|---|---|
| ULTRA LIGHT | Less than 300 cubic feet | Panels, Braces, Ring Mounts, M116 Trailers |
| LIGHT | Greater than 300 cubic feet but less than 1000 cubic feet | HMMWV, M105 Trailer |
| MEDIUM | Greater than 1000 cubic feet but less than 2000 cubic feet | LVS Family of Vehicles |
| HEAVY | Greater than 2000 cubic feet but less than 3000 cubic feet | M923 Five Ton Truck |
| OVERSIZE | Greater than 3000 cubic feet | 621B Scraper, RTCH |

Figure 4-1.—Size Classifications

4. In instances where III MEF organizations request corrosion rehabilitation services for individual parts or components not associated with a Principal End Item (PEI), an Equipment Repair Order and Service Contract will be assigned for the job. The size classifications and number of items on each ERO/service contract will be agreed upon by the CRF and contractor based on the existing size classifications delineated in the SOW.

5. If an allotted quota cannot be met, III MEF organizations may substitute an item of like size or smaller. Equipment substitutions must be coordinated through the respective MSC after liaison has been made with the CRF.

6. Requests for scheduling additional equipment into CRF above a unit's allotted quota will be submitted to the AC/S, G-4, III MEF via the respective MSC and after liaison with the CRF.

4003. CORROSION REHABILITATION MAINTENANCE PHASES

1. Induction and Acceptance Phase.

a. Administration. All requests for corrosion rehabilitation to include body repair, will be supported by an Equipment Repair Order (ERO). Only one item per ERO is authorized for induction. For

Marine Corps organizations that do not use the MIMMS AIS and supported sister services (U.S. Army, U.S. Navy, and U.S. Air Force), the CRF will prepare and complete the ERO. Administrative requirements are as follows:

(1) A 2nd echelon ERO must be open in MIMMS AIS.

(2) Customers will prepare a courtesy 3rd echelon ERO and bring a copy of the Daily Process Report (DPR) displaying the open 2nd echelon ERO. Ensure the ERO lists a current point of contact with phone numbers that can be reached during and after working hours.

(3) Customers will provide the Equipment Record Jacket, NAVMC 696, for motor transport and engineer equipment at time of induction.

(4) Ensure a current Unit ERO Authorization letter is on hand at the CRF.

(5) When customers drop off equipment that must be transported at night to CRF after working hours, they must come to CRF the following day so the equipment can be inspected/inducted and all paper work completed. Only then will the equipment be inducted into CRF. This administrative process must be accomplished the following day; there will be no exceptions to this provision. If a customer has to pick up equipment that requires transportation at night, the paperwork/ERO needs to be closed out prior to picking the equipment up from CRF. Customers may close out the paperwork/ERO during normal working hours at any time after all completion of the corrosion rehabilitation process. Customers need not wait until the day prior to pickup to close out the paperwork/ERO. Equipment will not be released to the customer until the paperwork/ERO is closed. Customers who need to deliver or pick up equipment from the CRF after normal working hours must make liaison with the CRF prior to either action.

(6) Once an item arrives at CRF for induction, a joint inspection will be conducted using an Equipment Induction Inspection Form as depicted in Appendix E. If the equipment passes inspection, the ERO and the equipment will be accepted. If equipment fails, a copy of the form will be made available to the customer at which time the customer has the option of correcting noted discrepancies on-site or returning the equipment to the customer's maintenance facility. Repairs that are made on-site must be completed within 48 hours or the equipment must be removed and repaired at the customer's facility. Once the equipment is repaired, it will be re-inspected and inducted.

(7) Upon acceptance of equipment, a locally generated tag will be filled out and attached to the equipment. The equipment will be stored in the Short Space lot until it enters the corrosion rehabilitation shop space. The Inspection Sheet will be turned into the Data Clerk who will input the information into the database, assign a contract number, and give a Request for Services Sheet to the contractor.

b. Equipment preparation requirements. The equipment owner is responsible for preparing equipment for induction into the CRF. Equipment preparation requirements are as follows:

(1) All equipment must be operational. Motorized equipment must be able to move under its own power and brakes must be fully operational. If the equipment malfunctions in the repair cycle, the owning unit will be contacted to make repairs.

(2) All 1st echelon preventative maintenance (except oil can maintenance) will be performed prior to induction. Note: 1st echelon PM can be performed while the equipment is in Short Space Status (weekly PM's). Units must ensure the equipment has no leaks or seeps. The equipment must be clean to include suspension, frame and the underside of engine covers must be free of grease and oil.

(3) Fuel tanks for all Motor Vehicles and Heavy Equipment must be 3/4 full.

(4) All generators, welders, and air compressors must be empty of fuel (see paragraph 4003.1.b(5) below.)

(5) Fuel carrying equipment must have a current gas free engineering initial testing certificate (Sixcon tanks, M-970 and M-49 Refuelers) from the MCB Camp Butler, Japan Safety Office. This includes all generators, welders, and air compressors.

(6) Underside hood insulation on all on M939 5 ton trucks must be removed (this allows easier access to the under side of the hood and helps ensure better undercoating).

(7) All SL-3 and Operational Vehicle Mobile (OVM) items must be removed prior to induction including: all canvas, canvas framing, exterior straps, tie downs, spare tires, and seat cushions. If SL-3 items are inducted into the CRF, a separate component ERO is required.

(8) All radio-related items must be removed from Communications Vehicles.

(9) The CRF will require access to the inside of all shelters and containers. Contents either have to be removed for security purposes or arrangements made with the CRF to have owning organization personnel on site at CRF when the repairs are being made.

(10) License plates will be removed at CRF after acceptance of equipment is complete.

(11) Customers inducting equipment with special or unique applications will provide a knowledgeable technician or working party to ensure all special requirements applicable to the equipment are addressed during the corrosion rehabilitation process. Some examples of equipment falling into this category are howitzers, radar and satellite dishes, applique armor plating and ordnance vehicles.

2. Active Maintenance Phase

a. During this phase of the corrosion rehabilitation process,corrosion repairs are accomplished. MIMMS AIS Job Status (12), Repairs in Progress, will reflect on the DPR. During this phase, Marines assigned to the CRF continuously monitor equipment at each station within the repair cycle. Once corrosion rehabilitation is completed, CRF Marines will perform Quality Assurance Inspections.

b. Replacement Parts: Although the contractor is required to supply the material to fabricate and repair the equipment processed at the CRF, in some cases the government will supply the replacement parts if it is not economical or safe for the contractor to fabricate them, or when the contractor is unable to purchase parts such as 5 ton truck hood hinges, windshield assemblies, hardback rear windows and the like. Items determined to be beyond repair will be brought to the attention of the customer who is responsible for requisitioning replacement parts. The customer should attempt to get all body components repaired at CRF before requisitioning a replacement.

c. Non-Repairable Equipment: If an item of equipment is determined to be a candidate for washout, a CRF Letter of Unserviceable Property (LUP) will be provided to the customer. The customer will deliver the LUP to the appropriate Intermediate Maintenance Company and coordinate submission of the Recoverable Item Report transaction (WIR).

d. Deadlined or Inoperative Equipment: In the event an item of equipment becomes deadlined during the corrosion rehabilitation cycle, the customer's unit will be contacted to take whatever actions necessary to repair the item. If equipment cannot be repaired on site, it will be removed from the maintenance cycle. The ERO will be placed in unit recall status for no more than 15 days to allow the owning unit to make repairs and return the equipment. If it is not likely the equipment can be repaired in a reasonable amount of time, the owning unit may substitute a like item or the ERO will be closed.

3. Maintenance Close out Phase

a. The close out phase begins when the Government's Final Inspector has accepted the item, and signs for the equipment on behalf of the U.S. Government. At this point, the equipment is ready for delivery to the customer. The following actions occur during this phase:

(1) The CRF will complete all administrative actions required to close out the corrosion rehabilitation process such as MIMMS AIS transactions and updating equipment records.

(2) The customer is notified their equipment is ready for pick up. Due to CRF's limited stowage space, every effort must be made by the customer to pick up their equipment in a timely manner. Barring inclement weather or operational demands beyond the customer's control, the customer's unit has 10 working days to pick up their equipment.

(3) When the customer picks up the equipment, a Customer Service Card will be provided for each item repaired. The Customer Service Card is a vital tool in tracking and assessing quality assurance. The customer will complete the Customer Service Card and return it to the CRF.

# APPENDIX A

## ANNUAL CPAC EQUIPMENT REPORT FORMAT

| TAMCN | NSN | NOMENCLATURE | SERNR | AAC | UNIT_DESCR | MSC | REMARKS | CORR CAT | CARC_DATE |
|---|---|---|---|---|---|---|---|---|---|
| B0391 | 393001269493 | TRUCK,MATERIAL HANDLI | 560018 | M00172 | MWSS-172 | 1st MAW | WBCC | 1 | 99274 |
| B0443 | 381001320192 | CRANE,BASIC UNIT,TR | 569802 | M00172 | MWSS-172 | 1st MAW | | 3 | |
| B0443 | 381001320192 | CRANE,BASIC UNIT,TR | 569806 | M00172 | MWSS-172 | 1st MAW | | 3 | |
| B0446 | 381001165064 | CRANE,WHEEL MOUNTED | 568774 | M00172 | MWSS-172 | 1st MAW | | 4 | |
| B0446 | 381001165064 | CRANE,WHEEL MOUNTED | 568780 | M00172 | MWSS-172 | 1st MAW | WBCC | 2 | 98091 |
| B0446 | 381001165064 | CRANE,WHEEL MOUNTED | 568806 | M00172 | MWSS-172 | 1st MAW | | 2 | |
| B0635 | 623001170140 | FLOODLIGHT SET,ELEC | 86S003 | M00172 | MWSS-172 | 1st MAW | | 2 | |
| B0635 | 623001170140 | FLOODLIGHT SET,ELEC | 86S029 | M00172 | MWSS-172 | 1st MAW | | 2 | |
| B0635 | 623001170140 | FLOODLIGHT SET,ELEC | 86S185 | M00172 | MWSS-172 | 1st MAW | | 2 | |
| B0635 | 623001170140 | FLOODLIGHT SET,ELEC | 86S429 | M00172 | MWSS-172 | 1st MAW | | 2 | |
| B0635 | 623001170140 | FLOODLIGHT SET,ELEC | 86S432 | M00172 | MWSS-172 | 1st MAW | | 3 | |

### HEADER INFORMATION KEY

1. TAMCN: Enter the Table of Authorized Material Control Number.
2. NSN: Enter the National Stock Number of item of equipment being reported.
3. Enter the Nomenclature of item of equipment being reported.
4. SERNR: Enter the serial number of item of equipment being reported.
5. AAC: Enter the Activity Account Code of the unit submitting the report.
6. UNIT DESCR: Enter the name of the unit submitting the report.
7. MSC: Enter the reporting unit's Major Subordinate Command.
8. REMARKS: Enter amplifying information such as type of paint or any other information that will aid the unit in analyzing the corrosion condition of its equipment.
9. CORR CAT: Enter the determined corrosion category code of the equipment being reported using Figure 1-1 in Chapter 1.
10. Enter the last recorded date that the equipment was painted with CARC. This information can or should be found in the NAVMC 696D or may even be stenciled on the equipment.

### SUBMISSION REQUIREMENTS

The Annual CPAC Equipment Report will be compiled on a Microsoft Excel Spreadsheet using the above format and submitted via email to the III MEF CPAC Coordinator.

# APPENDIX B

## CPAC INSPECTION CHECKLIST

1. Has the unit developed a Corrosion Prevention and Control (CPAC) Program? (ForO 4790.1, Par 1000.3)

Yes____ No____

2. Has the unit established its CPAC baseline? (ForO 4790.1, Par 1001.2)

Yes___ No___

3. Has the unit properly categorized the corrosion condition of its equipment? (ForO 4790.1, Par 1001.3)

Yes____ No____

4. Has the unit incorporated CPAC into its training plan? (ForO 4790.1, Par 1001.4)

Yes____ No____

5. Has the unit developed comprehensive CPAC Turnover Files and Desktop Procedures? (ForO 4790.1, Par 1001.5)

Yes____ No____

6. Has the unit assigned a CPAC Coordinator in writing? (ForO 4790.1, Par 1002.2)

Yes____ No____

7. Has the unit submitted results of its annual CPAC inspection to CG III MEF (AC/S G-4/MRB)? (ForO 4790.1, Par 1004.4 and Appendix A)

Yes____ No____

8. Has the unit conducted CPAC internal reviews/inspections? (ForO 4790.1, Par 1005.2 and Appendix B)

Yes____ No____

9. Has equipment assigned to the 31st Marine Expeditionary Unit (MEU) less 31st MEU Command Element Table of Equipment items been rotated after two consecutive deployments? (ForO 4790.1, Par 3002.3)

Yes____ No____

# APPENDIX C

## MCO 4790.18 - FORO P4795.1 CORROSION CATEGORY EQUIVALENCY CHART

| CATEGORY | DEFINITION | GOAL | MCO 4790.18 EQUIVALENT CATEGORY |
|---|---|---|---|
| Corrosion Condition 1 (CC-1) | Requires little or no effort. Is in the best condition with regard to corrosion. | The goal at this level is maintain the end item as CC-1. | None |
| Corrosion Condition 2 (CC-2) | Requires surface preparation and spot paint at the operator and/or organizational level. | The goal of this effort should be to return this end item to CC-1. | None |
| Corrosion Condition 3 (CC-3) | Requires effort beyond the operator level and will require assistance at the mechanic/technician level beyond the organic level. Example: Spot painting has arrested the corrosion, but the vehicle requires complete repainting and overcoat. Must be managed by the Unit Commander and inducted into the CRF for painting. | The goal of this effort is to schedule the end item into the CRF and return the end item to CC-1. | CATEGORY-A: Paint and undercoating only. |
| Corrosion Condition 4 (CC-4) | Requires repair to sheet metal or major frame components beyond the organizational level and must be inducted into Intermediate level repairs prior to induction into the CRF. Example: Chassis frame rails on HMMWVs, or support frames on cargo trailers. | The goal of this effort is to immediately induct this end item into the Intermediate Maintenance Level and manage the repairs through the IMA and into the CRF. | CATEGORY-B: Paint, blast, and undercoating with minor body work (i.e., replacement or repair of components such as doors, fenders, or battery boxes due to corrosion.)<br><br>CATEGORY-C: Includes everything listed in CATEGORY-B, in addition to component disassembly required to arrest and treat corrosion. |
| Corrosion Condition 5 (CC-5) | Is degraded to a degree that requires replacement of the end item based on the deterioration caused by corrosion. | The goal of this effort is to replace the end item. | CATEGORY-D: Requires depot (5th echelon) maintenance. |

APPENDIX D

FORMAT FOR CORROSION REHABILITATION NOMINATIONS

4795
Code
Date

From: CPAC Customer
To: Commanding General, III MEF (AC/S, G-4/MRB)
Via: MSC

Subj: CORROSION REHABILITATION NOMINATION

Ref: (a) ForO 4795.1

1. Per the reference, the following item(s) are nominated for induction to the III MEF Corrosion Rehabilitation Facility (CRF):

| Owning Unit AAC | TAMCN | Nomenclature | USMC/Ser Number | Corrosion Category | Last CRF Date |
|---|---|---|---|---|---|

2. Owning unit Point of Contact is _____ at telephone number DSN_____.

//SIGNATURE//

(Corrosion rehabilitation nominations can be submitted via electronic mail to the GSM Co organizational mailbox **crf@3fssg.usmc.mil**)

# APPENDIX E

## CPAC EQUIPMENT INDUCTION INSPECTION FORM

**LIMITED TECHNICAL INSPECTION - MOTOR TRANSPORTATION (4730)**
**NAVMC 10284** (REV. 8-83) (EF) SN: 0000-00-003-1906 U/I: PAD (100 SHEETS PER PAD)
(PREVIOUS EDITIONS ARE OBSOLETE AND WILL NOT BE USED)

| TYPE OF VEHICLE (ID NUMBER) | UNIT ASSIGNED | SIZE | DRIVE |
|---|---|---|---|
| | | | |

| MANUFACTURER | MODEL | CHASSIS SERIAL NO. | YEAR OF MANUFACTURE | REGISTRATION NO. |
|---|---|---|---|---|
| | | | | |

CONDITION CODE ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G ☐ H ☐ W ☐ Y ☐ Z ☐ Z

MILEAGE

| GROUP | PART | SATISFACTORY | REPAIR | REPLACE | MISSING | COST | GROUP | PART | SATISFACTORY | REPAIR | REPLACE | MISSING | COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | ENGINE | | | | | | 13 | TIRES | | | | | |
| 02 | CLUTCH | | | | | | 13 | VALVES | | | | | |
| 03 | CARBURETOR | | | | | | 13 | WHEELS | | | | | |
| 03 | FUEL PUMP | | | | | | 14 | STEERING GEAR | | | | | |
| 03 | FUEL TANK | | | | | | 14 | HYDRAULIC SYSTEM | | | | | |
| 03 | [DIST.] / UNIT/SPVL FUEL | | | | | | 15 | FRAME | | | | | |
| | (a) INJECTORS | | | | | | 15 | TOWING CONNECTOR | | | | | |
| | (a) METER/PUMP | | | | | | 16 | SHOCK ABSORBERS | | | | | |
| | (a) TURBO CHARGER | | | | | | 16 | SPRINGS | | | | | |
| | (a) FLAME HEATER | | | | | | 17 | FENDERS | | | | | |
| 04 | MUFFLER & TAIL PIPE | | | | | | 17 | HOOD | | | | | |
| 05 | FAN & WATER PUMP | | | | | | 18 | BODY | | | | | |
| 05 | RADIATOR | | | | | | 18 | CAB | | | | | |
| 06 | BATTERY | | [illegible] | | | | 18 | FLOOR | | | | | |
| 06 | DISTRIBUTOR | | | | | | 18 | GLASS | | | | | |
| 06 | ALTERNATOR | | | | | | 18 | INTERIOR TRIM | | | | | |
| 06 | LIGHTS | | | | | | 18 | HEAT & VENTILATION | | | | | |
| 06 | STARTER | | | | | | 20 | WINCH | | | | | |
| 06 | REGULATOR | | | | | | 21 | BRAKES SHOE DRUM | | | | | |
| 06 | WIRING | | | | | | 21 | PUMPING | | | | | |
| 07 | TRANSMISSION | | | | | | 22 | VEHICLE ACCESSORIES | | | | | |
| 08 | TRANSFER | | | | | | 22 | CANVAS | | | | | |
| 09 | DRIVE SHAFT | | | | | | 22 | INSTRUMENTS | | | | | |
| 10 | FRONT AXLE | | | | | | 27 | ARMAMENT | | | | | |
| 11 | INTERMEDIATE AXLE | | | | | | 28 | PAINT | | | | | |
| 11 | REAR AXLE | | | | | | 29 | FIFTH WHEEL | | | | | |
| 12 | PARKING BRAKE SYSTEM | | | | | | 30 | DUMP HOIST | | | | | |
| 12 | SERVICE BRAKE SYSTEM | | | | | | 31 | WINCH CONT | | | | | |

DEFECT REMARKS

| | YES | NO |
|---|---|---|
| BODY | ☐ | ☐ |
| MINOR ☐ | | |
| MODERATE ☐ | | |
| EXTENSIVE ☐ | | |
| EXTREME ☐ | | |
| SANDBLAST | ☐ | ☐ |
| STEAM CLEAN | ☐ | ☐ |
| UNDERCOAT | ☐ | ☐ |
| SKID FAB | ☐ | ☐ |
| REDECKING | ☐ | ☐ |
| RUST INHIB | ☐ | ☐ |
| PAINT | ☐ | ☐ |
| SPOT PAINT | ☐ | ☐ |

SPECIAL REMARKS

| DATE | MECHANIC SIGNATURE | |
|---|---|---|
| ACTIVITY | DATE | SIGNATURE OF MAINTENANCE OFFICER |

Ro7

CPAC SOP

DEPARTMENT OF THE NAVY
U.S. NAVAL HOSPITAL
PSC 482
FPO AP 96362-1600

6260.3
Ser 062/6509
31 Jul 00

From: Commanding Officer, U.S. Naval Hospital, Okinawa
To: Officer-In-Charge, Field Supply and Maintenance Analysis Office Three, PSC 557 BOX 961, FPO AP 96379-5000

Subj: EXPOSURE MONITORING RESULTS TO HEAVY METAL PARTICULATES WHEN SCRAPING/CHIPPING CARC PAINT WITH WIRE BRUSHES

Ref: (a) Your ltr of 13 Mar 00
(b) Title 29, Code of Federal Regulations, Part 1910.1025
(c) ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices, 1999

Encl: (1) Air Sampling Results

1. Per reference (a), the Industrial Hygiene Department conducted air sampling on 5, 11, 18, 25 April, and 9, 23 May 2000 to measure personnel exposures to heavy metals - hexavalent & total chromium, lead, copper, and iron oxide while conducting corrosion control work on ground equipment. The Marines monitored during the survey were TSB Motor Transport personnel who were specifically assigned to conduct this operation. Our purpose for performing this survey was to determine the adequacy of current safety precautions and personal protective equipment used by the Marines during corrosion control activities.

2. The air sampling results, as detailed in enclosure (1), indicate that the monitored individuals were not exposed to heavy metals above the Permissible Exposure Limits (PELs) or Threshold Limit Values (TLVs) as established in references (b) and (c) when conducting corrosion control work with wire brushes. Additionally, these results indicate that the work practice controls are effective and additional exposure controls are not required.

3. Respiratory protective equipment are not required to be worn when conducting corrosion control work with wire brushes on ground equipment. However negative pressure, half-mask respirators with high efficient particulate air (HEPA) filter cartridges should be used when conducting this work with portable electric tools, as there is significant potential for overexposure. In addition, when conducting touchup painting with waterborne camouflage coating paint, half-mask respirators with organic vapor cartridges should be worn.

6260.1 (2K-119)

# EXPOSURE MONITORING RESULTS OF AIR SAMPLING

## 3D FSSG, Transport Support Battalion (TSB), Motor T Maintenance

References: (a) Title 29, Code of Federal Regulations, Part 1910
(b) ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices, 1999

1. Location: Camp Foster, TSB Motor T Maintenance, Building 5649

2. Process Monitored: The air monitor sampling was conducted during the period of 4/05/00 to 5/23/00. A half mask respirator (3M half mask with organic and HEPA filter cartridges) was worn by all personnel monitored during each day of these operations. Specific work operations monitored are described as follows:

a. 4/05/00: Four Marines of Transport Support Battalion (TSB), Motor T Maintenance Section, were monitored for exposure to total chromium, chromium VI, lead, copper and iron oxide while they performed corrosion control work on various ground equipment. Specifically, the Marines performed metal corrosion (rust/paint) removal work using wire brushes. The work operation was conducted outdoors on the Motor T compound, and the work duration was approximately 164 minutes.

b. 4/11/00: TSB Marines conducted corrosion control work indoors in a maintenance bay of Building #5649. The monitored individuals wire brushed ground equipment - consisting of MK 48 (LVS) and MK 14 (trailer), 5-ton Trucks, and Humvees. The forward and rear (2) bay doors of the facility were kept open to provide general ventilation.

c. 4/18/00: As previously described, TSB Marines conducted corrosion control work on LVSs and 5-ton trucks. The work operation was conducted outdoors. When conducting this work on the compound, the Marines laid plastic sheets to capture paint chips. A total of six vehicles were completed during this monitoring period.

d. 4/25/00: TSB Marines conducted corrosion control work indoors in a maintenance bay of Building #5649. Six of the bay doors were opened. They worked on a LVS - MK48 truck and MK14 trailer, and two 5-ton trucks. Only wire brushes were used. The duration of the operation was from 153 to 163 minutes.

e. 5/09/00: The work operation was conducted indoors of Building #5649. Additionally, one of the four Marines used a portable, electric grinder to remove corrosion from ground equipment. Other three workers conducted their corrosion removal work using wire brushes. The duration of the operation was from 105 to 160 minutes.

f. 5/23/00: The work operation was continued indoors at Building #5649 maintenance bay. All workers used wire brushes. The duration of the operation was 105 minutes.

3. Hazard:

a. **Lead (Pb)**: Lead is a very toxic metal. Acute overexposure may cause fatigue, sleep disturbances, headache, aching bones and muscles, and digestive problems (lead colic). Chronic overexposure may adversely and permanently affect the central nervous system, reproductive organs, kidneys, and blood-forming organs.

b. **Chromium**: Chromium is a metal of relatively low toxicity. However, chronic overexposure may cause decreased lung function.

c. **Chromium VI (Chromate)**: Hexavalent chromium compounds such as zinc chromate, strontium chromate, and lead chromate are considered Class A1 human carcinogens. They are severely irritating to the skin and respiratory system. Acute overexposure may cause coughing and wheezing, headache, shortness of breath, and fever. Chromium VI is commonly found in zinc chromate paint primers.

d. **Copper**: Copper is irritating to the skin, eyes, nose and throat. Acute overexposure may cause a short-term, generally reversible, flu-like illness called "metal fume fever". Immediate symptoms may include dryness and irritation of the throat. After a few hours delay, chills, fever, nausea and other flu-like symptoms may develop. This condition usually lasts for approximately six to 48 hours. Chronic overexposure may cause lung damage.

e. **Iron oxide**: Iron is a metal of low toxicity. Chronic overexposure may cause benign, symptomless lung changes (siderosis).

4. Results:

| Wade - 3293 | | | | |
|---|---|---|---|---|
| STRESSOR | Sampling Date | Duration (minutes) | TWA Results ($mg/m^3$) | Standard ($mg/m^3$) |
| Ttl chromium | 4/5/00 | 164 | 0.0005 | 0.5 |
| Lead | | 164 | 0.0004 | 0.05 |
| Copper | | 164 | 0.0015 | 1 |
| Iron oxide | | 164 | 0.0067 | 10 |
| Chromium VI | | 164 | 0.0001 | 0.01 |

mg/m3 = milligram per cubic meter
TWA = time weighted average

| Wade - 3293 | | | | |
|---|---|---|---|---|
| STRESSOR | Sampling Date | Duration (minutes) | TWA Results ($mg/m^3$) | Standard ($mg/m^3$) |
| Ttl chromium | 4/11/00 | 197 | 0.0015 | 0.5 |
| Lead | | 197 | 0.0015 | 0.05 |
| Copper | | 197 | 0.0015 | 1 |
| Iron oxide | | 197 | 0.061 | 10 |
| Chromium VI | | 150 | 0.0004 | 0.01 |
| Ttl chromium | 4/18/00 | 215 | 0.0007 | 0.5 |
| Lead | | 215 | 0.0015 | 0.05 |
| Copper | | 215 | 0.0009 | 1 |
| Iron oxide | | 215 | 0.052 | 10 |
| Chromium VI | | 215 | 0.0003 | 0.01 |
| Ttl chromium | 4/25/00 | 155 | 0.0005 | 0.5 |
| Lead | | 155 | 0.0016 | 0.05 |
| Copper | | 155 | 0.0005 | 1 |
| Iron oxide | | 155 | 0.0085 | 10 |
| Chromium VI | | 155 | 0.0002 | 0.01 |
| Ttl chromium | 5/9/00 | 105 | 0.0016 | 0.5 |
| Lead | | 105 | 0.0015 | 0.05 |
| Copper | | 105 | 0.001 | 1 |
| Iron oxide | | 105 | 0.77 | 10 |
| Chromium VI | | 105 | 0.0001 | 0.01 |

| O'Hearon - 6054 | | | | |
|---|---|---|---|---|
| STRESSOR | Sampling Date | Duration (minutes) | TWA Results ($mg/m^3$) | Standard ($mg/m^3$) |
| Ttl chromium | 4/5/00 | 164 | 0.0004 | 0.5 |
| Lead | | 164 | 0.0009 | 0.05 |
| Copper | | 164 | 0.0015 | 1 |
| Iron oxide | | 164 | 0.0057 | 10 |
| Chromium VI | | 145 | 0.0004 | 0.01 |

mg/m3 = milligram per cubic meter
TWA = time weighted average

| O'Hearon - 6054 | | | | |
|---|---|---|---|---|
| STRESSOR | Sampling Date | Duration (minutes) | TWA Results ($mg/m^3$) | Standard ($mg/m^3$) |
| Ttl chromium | 4/11/00 | 199 | 0.0015 | 0.5 |
| Lead | | 199 | 0.0015 | 0.05 |
| Copper | | 199 | 0.0015 | 1 |
| Iron oxide | | 199 | 0.027 | 10 |
| Chromium VI | | 199 | 0.00004 | 0.01 |
| Ttl chromium | 4/18/00 | 220 | 0.0011 | 0.5 |
| Lead | | 220 | 0.0015 | 0.05 |
| Copper | | 220 | 0.0009 | 1 |
| Iron oxide | | 220 | 0.013 | 10 |
| Chromium VI | | 220 | 0.0003 | 0.01 |
| Ttl chromium | 4/25/00 | 153 | 0.0005 | 0.5 |
| Lead | | 153 | 0.0014 | 0.05 |
| Copper | | 153 | 0.0004 | 1 |
| Iron oxide | | 153 | 0.0067 | 10 |
| Chromium VI | | 153 | 0.0001 | 0.01 |
| Ttl chromium | 5/9/00 | 160 | 0.0007 | 0.5 |
| Lead | | 160 | 0.0015 | 0.05 |
| Copper | | 160 | 0.0044 | 1 |
| Iron oxide | | 160 | 0.033 | 10 |
| Chromium VI | | 152 | 0.0001 | 0.01 |
| Ttl chromium | 5/23/00 | 105 | 0.0016 | 0.5 |
| Lead | | 105 | 0.0023 | 0.05 |
| Copper | | 105 | 0.0011 | 1 |
| Iron oxide | | 105 | 0.0088 | 10 |
| Chromium VI | | 105 | 0.0001 | 0.01 |

mg/m3 = milligram per cubic meter
TWA = time weighted average

| Parrott - 5773 | | | | |
|---|---|---|---|---|
| STRESSOR | Sampling Date | Duration (minutes) | TWA Results ($mg/m^3$) | Standard ($mg/m^3$) |
| Ttl chromium | 4/5/00 | 164 | 0.0004 | 0.5 |
| Lead | | 164 | 0.0006 | 0.05 |
| Copper | | 164 | 0.0015 | 1 |
| Iron oxide | | 164 | 0.0021 | 10 |
| Chromium VI | | 164 | 0.0001 | 0.01 |
| Ttl chromium | 4/11/00 | 201 | 0.0015 | 0.5 |
| Lead | | 201 | 0.0015 | 0.05 |
| Copper | | 201 | 0.0015 | 1 |
| Iron oxide | | 201 | 0.025 | 10 |
| Chromium VI | | 201 | 0.00004 | 0.01 |
| Ttl chromium | 4/18/00 | 215 | 0.0007 | 0.5 |
| Lead | | 215 | 0.0015 | 0.05 |
| Copper | | 215 | 0.0009 | 1 |
| Iron oxide | | 215 | 0.009 | 10 |
| Chromium VI | | 180 | 0.0004 | 0.01 |
| Ttl chromium | 4/25/00 | 163 | 0.0005 | 0.5 |
| Lead | | 163 | 0.0014 | 0.05 |
| Copper | | 163 | 0.0006 | 1 |
| Iron oxide | | 163 | 0.0067 | 10 |
| Chromium VI | | 163 | 0.0003 | 0.01 |
| Ttl chromium | 5/23/00 | 105 | 0.0011 | 0.5 |
| Lead | | 105 | 0.0022 | 0.05 |
| Copper | | 105 | 0.0011 | 1 |
| Iron oxide | | 105 | 0.021 | 10 |
| Chromium VI | | NM | NM | NM |

mg/m3 = milligram per cubic meter
TWA = time weighted average
NM = Not monitored

| Jolly - 8824 | | | | |
|---|---|---|---|---|
| STRESSOR | Sampling Date | Duration (minutes) | TWA Results ($mg/m^3$) | Standard ($mg/m^3$) |
| Ttl chromium | 4/5/00 | 164 | 0.0005 | 0.5 |
| Lead | | 164 | 0.0009 | 0.05 |
| Copper | | 164 | 0.0016 | 1 |
| Iron oxide | | 164 | 0.011 | 10 |
| Chromium VI | | 145 | 0.0004 | 0.01 |
| Ttl chromium | 4/11/00 | 200 | 0.0015 | 0.5 |
| Lead | | 200 | 0.0015 | 0.05 |
| Copper | | 200 | 0.0015 | 1 |
| Iron oxide | | 200 | 0.16 | 10 |
| Chromium VI | | 200 | 0.00004 | 0.01 |
| Ttl chromium | 4/18/00 | 98 | 0.0004 | 0.5 |
| Lead | | 98 | 0.0007 | 0.05 |
| Copper | | 98 | 0.0004 | 1 |
| Iron oxide | | 98 | 0.006 | 10 |
| Chromium VI | | 203 | 0.0002 | 0.01 |
| Ttl chromium | 5/09/00 | 150 | 0.0007 | 0.5 |
| Lead | | 150 | 0.0013 | 0.05 |
| Copper | | 150 | 0.0022 | 1 |
| Iron oxide | | 150 | 0.011 | 10 |
| Chromium VI | | 150 | 0.0001 | 0.01 |
| Ttl chromium | 5/23/00 | 105 | 0.0011 | 0.5 |
| Lead | | 105 | 0.0022 | 0.05 |
| Copper | | 105 | 0.0011 | 1 |
| Iron oxide | | 105 | 0.027 | 10 |
| Chromium VI | | 105 | 0.0001 | 0.01 |

mg/m3 = milligram per cubic meter
TWA = time weighted average

5. Exposure Standards: The Time Weighted Average - Permissible Exposure Limit (TWA-PEL) is considered the maximum limit which employees can be safely exposed to hazardous airborne contaminates up to eight hours per day, 40 hours per week.

6. Conclusion/Recommendations:

a. All sampling results were below the standard established by references (a) and (b).

b. Respiratory protective equipment are not required to be worn when conducting corrosion control work with wire brushes on ground equipment. However negative pressure, half-mask respirators with high efficient particulate air (HEPA) filter cartridges should be used when conducting this work with portable electric tools, as there is significant potential for overexposure. In addition, when conducting touchup painting with waterborne camouflage coating paint, half-mask respirators with organic vapor cartridges should be worn.

c. Due to the environmental concerns regarding uncontrolled release of hazardous waste (paint chip and particulate), we recommend that the corrosion removal work be conducted indoors in the maintenance bays. This work practice will significantly minimize any potential for environmental release of hazardous waste.

d. If power tools - needle gun, disk sander, grinder, and wheel abrader, are to be considered for use during corrosion removal work, ensure that tools equipped with HEPA vacuum-shrouded attachment are used.

# APPENDIX G

## MSC/E/ORGANIZATIONAL SPECIFIC POLICIES, PROCEDURES AND INSTRUCTIONS